



LOCKING ARRANGEMENTS FOR SIDE WALLS OF RIGID, FOLDABLE OR COLLAPSIBLE BOXES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention refers to locking arrangements for side walls of rigid boxes of the foldable or removable wall type. The invention can be especially applied to packing boxes reusable for fruits for export.

2. Description of the Related Art

In the field of boxes for the export of fruit or similar, a great number of boxes available is required at the packing stations, thus the use of boxes taking up a reduced storage space being advantageous, while they are in the stage prior to filling. Said boxes must be assembled in a fast and safe way.

There is a wide range of rigid or semi-rigid foldable or collapsible boxes for the transport of such products as fruits or similar for export and which are provided with locking arrangements allowing the joining of adjacent side walls in the rigid position of an assembled box.

One of these solutions is disclosed in U.S. Pat. N° 5,853,099 by Claude Lessard, where a five-piece open container with locking arrangement is shown, which is made up by a rectangular bottom piece and four side pieces (14, 16; 18, 20), with the upper portion of the side edge of these side pieces having built-in cooperating means in order to interengage the adjacent side pieces (14, 18) in an erect position. The interengaging means showing Lessard's locking arrangements are made up by flexible, finger actuatable means (36). Figures 1A-1C of this patent application show the sequence of action to be followed in

order to unlock the side walls of a container by hand according to Lessard invention. These Figs. 1A-1C are based on Figs. 3C-3A of U.S. Pat. N° 5,853,099 and their original number references are kept. In order to start the unlocking of the end piece (18), pressure should be exerted with one finger on the means (36) following the direction of the arrow (68), while with another finger the end piece (14) is pushed following the direction of the arrow (66'), as shown in Fig 1A, so that the projecting part (30) of the end piece may slide along the inner surface (up in the figure) of the projecting part (38) of the finger actuatable means (36). In this condition, the means (36) and their projection (38) are elastically bent, becoming loaded with a restitution force which will "trigger" the end piece (14) as soon as the finger that is exerting pressure in the direction of the arrow (68) starts to stop its action, thus producing a painful impact on such finger by the projecting part 30 of the end piece (14). This impact on the fingers of the person handling the containers is not negligible, if we consider that at the packing/unpacking centers, a person should disassemble hundreds of containers during a work shift and due to the narrow access zone to actuate the locking arrangements, these persons may not wear protecting gloves, since these would prevent the performance out of the containers' unlocking operation.

In this invention, on the contrary, the locking/unlocking arrangements of side walls do not produce any restitution force which may actuate as "trigger" for the walls intended to be unlocked.

BRIEF DESCRIPTION OF DRAWINGS

The locking arrangements for rigid boxes' side walls of this invention will be described in further detail by the support of drawings which have an illustrative but not restricted nature, where:

- **Fig. 1A, Fig. 1B and Fig. 1C** show locking arrangements of the state of the art as those disclosed in U.S. Pat. N° 5,835,099;
- **Fig. 2** shows a perspective view of a rigid box in an assembled condition and provided with the locking arrangements of this invention;
- **Fig. 3** shows an enlarged fragmentary perspective of the rear upper corner of the box of Fig. 2 with its adjacent side walls in a condition prior to the locking condition of its side walls;
- **Fig. 4A** is a cross-sectional view of the corner of the box shown by Fig. 3 according to a plane which is parallel to the box bottom in a condition prior to the locking of side walls;
- **Fig. 4B** is cross-sectional view of the corner of the box shown by Fig. 3 according to a plane which is parallel to the box bottom in an intermediate locking condition of its side walls;
- **Fig. 4C** is a cross-sectional view of the corner of the box shown by Fig. 3 according to a plane which is parallel to the box bottom in the final condition of locking of side walls.

DETAILED DESCRIPTION OF INVENTION

As shown in **Fig. 2** the rigid box **1** is made up by a bottom wall **2**, two head walls **4** opposing each other and two main side walls **6** opposing each other and respectively perpendicular to the head walls **4**. The side head walls **4** and the main side walls **6** may be independent of the bottom wall **2** or they may form part a set with it, provided that the zone of its lower edges is flexible, thus defining hinge areas between the head walls **4** and the bottom wall **2** and between the main side walls **6** and the bottom wall **2**. In the event that

the head walls 4 and the main side walls 6 are independent from the bottom wall 2 of box 1, the edges of the bottom wall 2 and the lower edges of the head walls 4 and the lower edges of side walls 6 are provided with supplementary hinge means in order to allow the pivoting assembly of side walls (4, 6) in relation to the bottom wall 2, so that the side walls (4, 6) are perpendicular to the bottom wall 2 when the box is already assembled by the locking of these side walls (4, 6).

In Fig. 3 through Fig. 4C the locking arrangements of side walls of this invention can be appreciated with further detail. These locking arrangements are located in the upper area of side edges of side walls (4, 6) and consist in sliding fastening elements or front release buckles where the upper zone of the side edges of main side walls 6 have their corresponding projecting fasteners 10, which main planes are parallel to the plane of the main wall 6. The upper zones of the side edges of head walls 4 have their corresponding housing boxes for the fastener 12 to accommodate the fasteners 10; they are oriented to the inlet openings of these fasteners-housing boxes 12 in order to allow the entering of the corresponding fastener 10 according to a relative displacement which is perpendicular to the plane of the corresponding head wall 4.

The projections of fastener 10 are made up by a portion of the perimetric frame 16 which farthest end edge 18 from the main wall 6 is joined to a wedge portion 17 oriented in a slightly oblique plane as regards the main plane of the perimetric frame 16 and using the area encircling this perimetric frame 16, all of this in such a way that the operating side 19 of the wedge portion 17 projects from the plane of the perimetric frame 16 and in such a way that this operating side 19 is oriented to the inside of the box but deeper than the end edge 18 of the perimetric frame 16.

Each housing box for the fastener **12** of the head wall **4** has an access area **13** for its operation restricted in one of its sides by a portion of the stop column **14** which is an integral part of the head wall **4** and parallel to the side edge thereof.

Although the material for the manufacture of the assembly of the invention is substantially rigid for the purposes of general strains to which the box is subject during normal use conditions, both as regards the load of material to be packed and to the stresses of the normal piling, it is natural that the material behaves with a certain resilience in the small thickness areas as the area where the wedge portion **17** joins the end **18** of the perimetric frame **16**. Thus, when a force is applied – substantially perpendicular to the main plane of the main side wall **6** outwards – on the operating side **19** of the wedge portion **17**, according to arrow **30** (Fig. **4C**), this wedge portion **17** shall elastically pivot around the end **18** until becoming completely housed in the area comprising the perimetric frame **16**.

In addition, the locking arrangements include rigid guiding projections **20**, which perform the function of resistant elements against the different stresses, thus preventing the locking arrangements to become damaged. These guiding projections **20** extend above and below the corresponding fastener **10** in a direction which is parallel to the plane of the corresponding main side wall **6**. Complementarily, the upper zones of the side edges of each head wall **4** have two corresponding housing boxes for guides **22** in order to receive the guides **20**, being oriented to the inlet openings of these housing boxes for guides **22** so that to allow the entering of the corresponding guide **20** according to a relative displacement which is perpendicular to the plane of the corresponding head wall **4**.

The box is assembled from an expanded condition (not shown) with its side walls not connected in the case of independent side walls or from folded side walls in planes which are substantially parallel to the plane of the bottom wall in the case of side walls

which form part of one single body with the bottom wall. This assembly in any of the two conditions mentioned above, starts by lifting side walls until the main side walls **6** reach a totally lifted position (or erect) and the head walls **4** may reach a quasi-totally lifted position, as shown in **Fig. 4A**. In this situation, the rigid guiding projections **20** of the main side walls **6** are facing the corresponding openings of the guide-housing boxes **22** of head walls **4**, and the fastener projections **10** of main side walls **6** are facing the corresponding inlet openings of the fastener-housing boxes **12** of head walls **4** and where the wedge portion **17** of fastener **10** is in its normal position, free from elastic distortion and with its operating side **19** projecting from the plane which defines the perimetric frame **16**.

The locking of side walls is simply achieved by completing the disassembly of head walls **4** according to arrow **35**. In the case guiding projections **20** are longer than the fastener projection **10**, this action first starts the relative penetration of guiding projections **20** of the main side walls **6** into the corresponding openings of the guide-housing boxes **22** of head walls **4**. Then, and when the guides **20** are not totally housed in their guide-housing boxes **22** or when these guiding projections **20** are shorter than the fastener projection **10**, the relative penetration of fastener **10** starts by introducing the end **18** first into the opening of the fastener housing box **12**, through which the external edge of the stop column **14** faces the internal side of the wedge portion **17**, which is forced to elastically distort until being completely retracted in the area which encircles the perimetric frame **16**, as depicted in **Fig. 4B**. When the lifting of the head wall **4** is completed, with this striking against the side edge of the main side wall **6**, the operating side **19** of the wedge portion **17** is beyond the internal edge of stop column **14**, thus ceasing the pressure exerted by it on the wedge portion **17**, which under these conditions is released in the direction of arrow **32** until recovering its initial geometry and with the operating side **19** facing the internal edge of the stop column

14, as depicted in **Fig. 4C**, thus the head walls 4 becoming respectively locked with the main side walls 6.

The operation to unlock the side walls of the box is simple and does not produce any “triggering” of not one of the walls against the fingers of the person who is performing this operation, as in the case of the state of the art’s boxes already mentioned. The sequence to follow may be understood by following the sequence shown by **Figs. 4C → 4B → 4A**. Usually, with one finger (or a simple tool) pressure is exerted on the inner side of the wedge portion 17 through the driving area 13 of the fastener housing box 12 in the direction of the arrow 30 until the wedge portion 17 is totally housed in the area comprising the perimetric frame 16, thus being able to disassemble the head wall 4 and moving it away from the side wall 6 according to arrow 36.

As it may be noted, the mechanic power stored in the area joining the end 18 with the wedge portion 17 of fastener 10 during the unlocking operation is neither willfully nor casually used to push any component of the walls we are trying to unlock, so that side walls will not spontaneously impact against the fingers of the person who is handling the unlocking.